

Updating the 1999 U.S.-Canada 220 MHz *Interim Arrangement*

FCC International Bureau

March 14, 2013

PTC 220, LLC

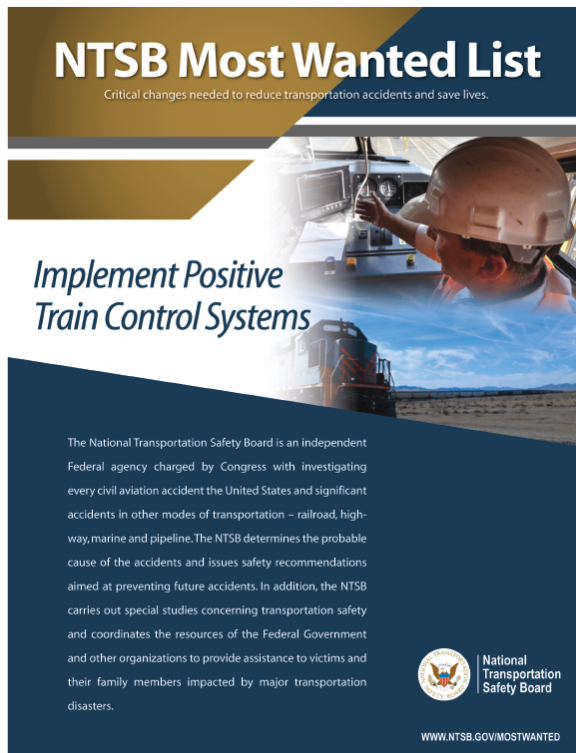
Agenda

- Positive Train Control Function and Mandate
- Role of PTC-220, LLC
- PTC Radiofrequency Requirements
- PTC-220/Industry Canada Meeting Summary
- Affected U.S.-Canada Border Areas
- Relief requested
 - Finalize US regulatory environment for PTC
 - Update the US-Canadian 220 MHz *Interim Arrangement* by September 2013



Source: National Transportation and Safety Board, Railroad Accident Report, Red Oak Iowa April 17, 2011 (April 24, 2012), available at <http://www.ntsb.gov/doclib/reports/2012/RAR1202.pdf>.

PTC Rail Safety System Overview



- Designated as one of the top ten priorities of the National Transportation Safety Board, Positive Train Control uses wireless technologies to monitor train activity and reduce the risk of accidents, including:
 - Train collisions
 - Over-speeding
 - Incursions into established work zones
 - Movement of a train through a switch left in the wrong position; and
 - Other unauthorized or unsafe train movements.
- The Rail Safety Improvement Act of 2008 requires PTC systems to be installed throughout most of the United States by December 31, 2015
- The nation's major (Class I) rail systems have 2 years, 9 months, and 17 days left to construct a new nationwide PTC network, including a substantial area along the Canadian border – a complex, multi-billion dollar investment
 - \$9.55 Billion to \$13.21 Billion capital and operating expenses (20 year) *
 - 60-70,000 route miles of track
 - 20,000 Locomotives
 - 40,000 Wayside Interface Units
 - ~~4,000 Base Stations~~

*Source: FRA 2009/10 estimates; Federal Railroad Administration (FRA), Department of Transportation (DOT), 77 Fed. Reg. 28285 (2012). FRA estimates do not include passenger rail systems.

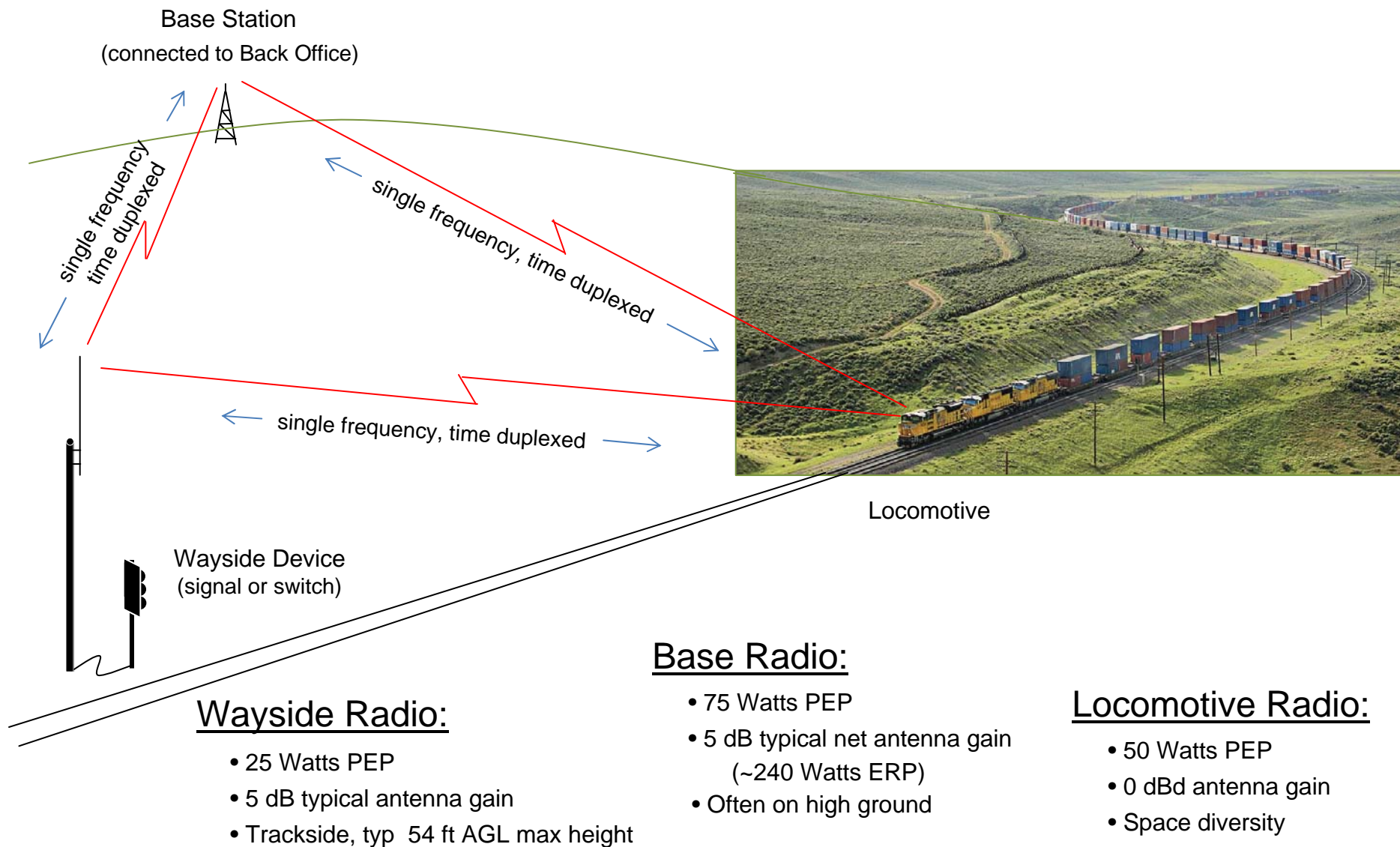
PTC-220, LLC

- Formed to design, develop, and support PTC rail safety deployment, PTC-220 is jointly owned by all seven Class I freight railroad operators, which include both major Canadian railroads and represent ~95% of mandated PTC operations:
 - BNSF Railway (“BNSF”)
 - Canadian National Railway (“CN”)
 - Canadian Pacific Railway (“CP”)
 - CSX Transportation (“CSX”)
 - Kansas City Southern Railway (“KCS”)
 - Norfolk Southern Railway (“NS”)
 - Union Pacific Railroad (“UP”)
- PTC-220 holds 16 FCC licenses in the 220-222 MHz band for PTC rail safety use

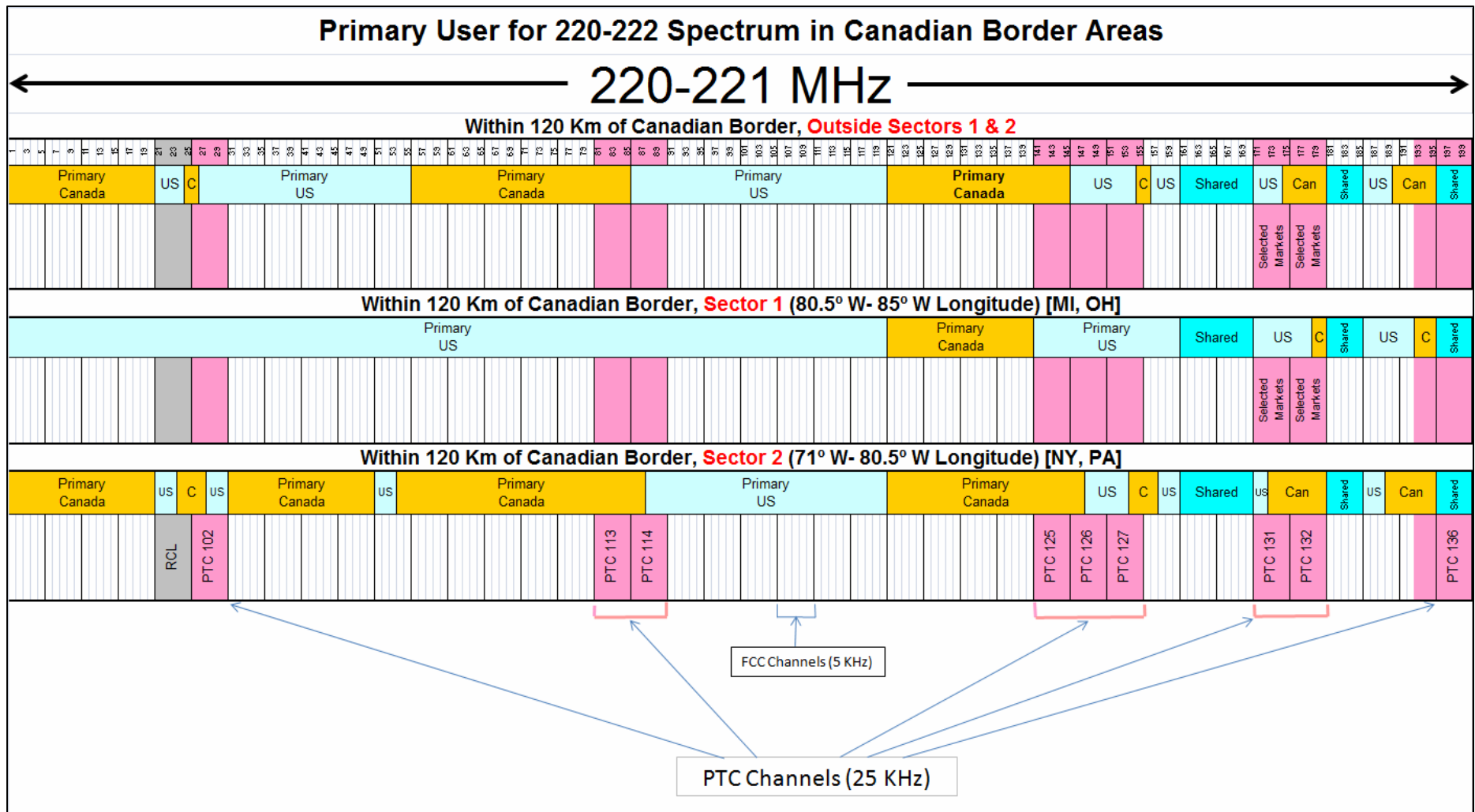


Source: National Transportation and Safety Board, Railroad Accident Report, Chatsworth, CA Sept. 12, 2008 (Jan. 21, 2010), available at <http://www.nts.gov/doclib/reports/2010/RAR1001.pdf>.

PTC-220 Radio System Details



PTC Band and PTC-220 Spectrum Holdings



PTC-220 Waiver Grant and Pending Waiver Request

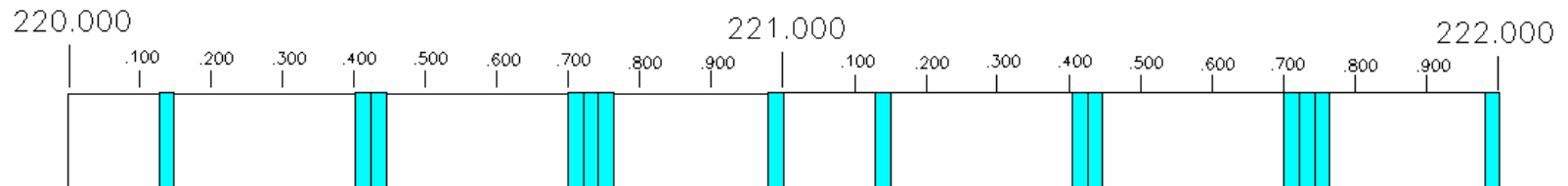
- In 2009, the FCC waived certain 220 MHz limitations to promote PTC deployment, including the FDD-only requirement of 47 CFR § 90.715. See MO&O, [WT Docket No. 08-256](#) (June 25, 2009).
- In 2013, PTC-220 asked the FCC to lift other barriers to TDD deployment. See Public Notice, [WT Docket No. 13-59](#) (March 8, 2013).
 - PTC-220 sought increased effective radiated power (ERP) and antenna height above average terrain (HAAT) in the 221-222 MHz band (47 CFR § 90.729(b))
 - PTC-220 asked to eliminate the coordination obligation for base stations in portions of the 221-222 MHz band for transmitting and receiving frequencies within 200 kHz or less (47 CFR § 90.723(f))

Relief Requested

- Grant 2013 Waiver Request found in [WT Docket No. 13-59](#)
- Incorporate both the 2009 Waiver Grant found in [WT Docket No. 08-256](#) and, if granted, the 2013 Waiver Request of pending in [WT Docket No. 13-59](#) in the *Interim Agreement*.
- Modify the *Interim Agreement* to allow U.S. and Canadian licensees to negotiate alternative arrangements upon mutual agreement of licensees on either side of the border.

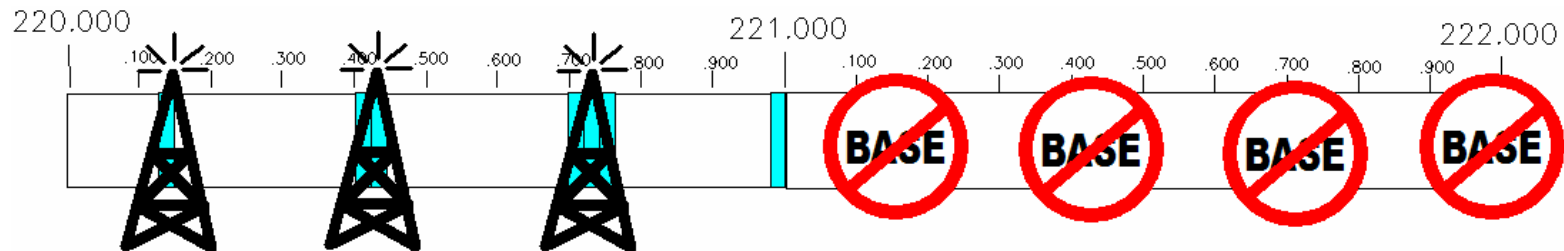
- **PTC does not use frequency-duplex channels**

All radios transmit and receive on the same frequency



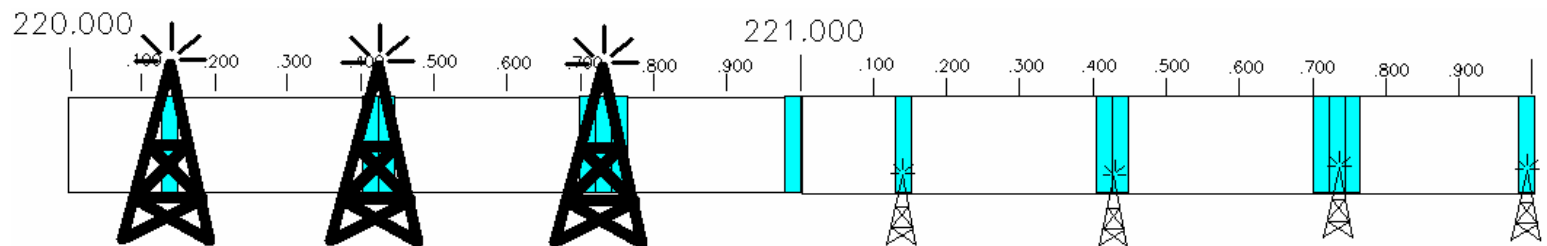
- **FCC rules limit base stations to the lower band segment**

Upper part of band would be underutilized

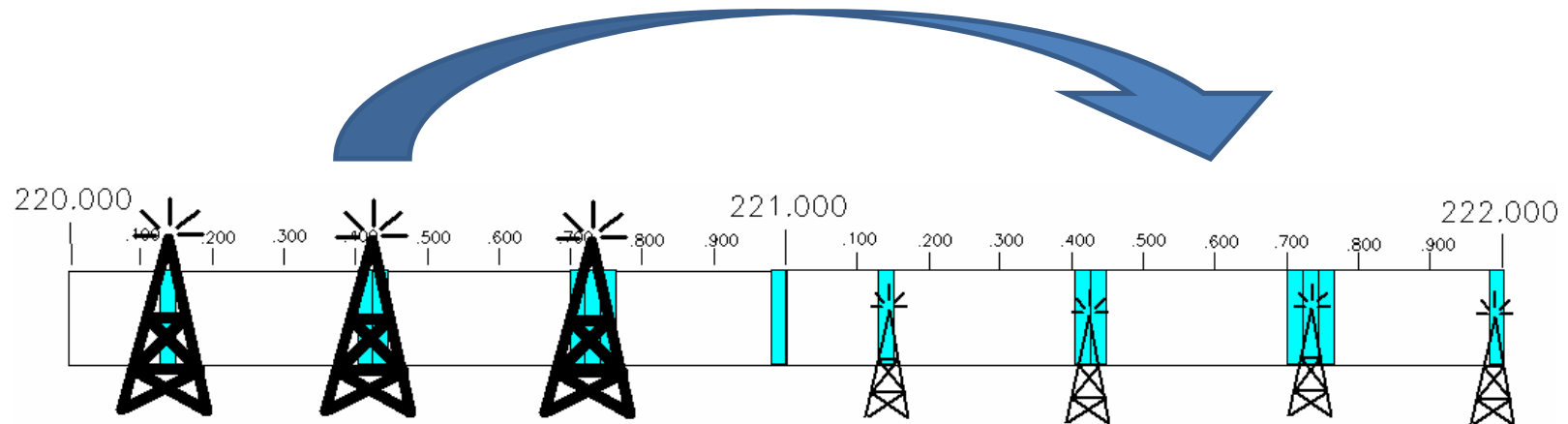


- **2009 waiver grants allow bases over entire band**

However, power/height limits remain

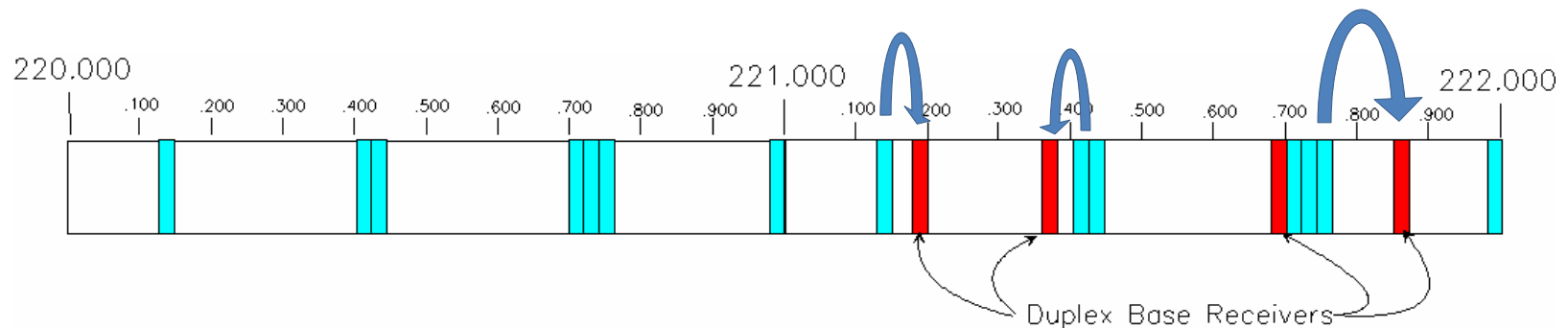


- PTC-220 seeks to use full power on bases in the upper part of the bar



- However, the current rules are designed to protect against interference to adjacent channel base receivers

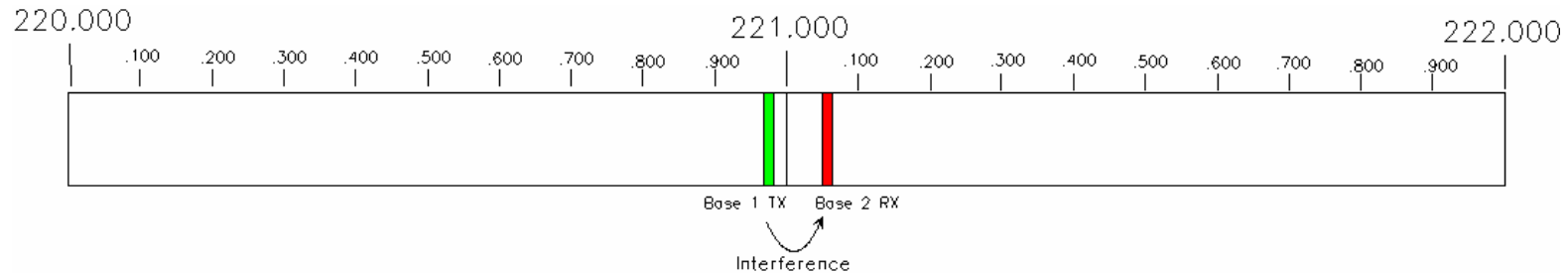
PTC-220's nationwide (and *de facto* nationwide) licenses will have no co-channel licensees



- **The FCC already faced this issue when writing the rules...**

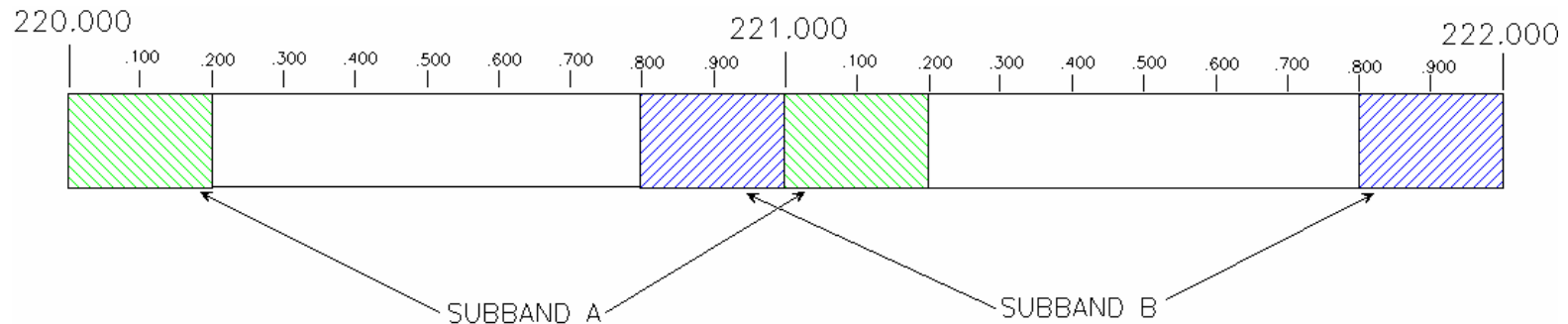
There is no spacing between the Base and Mobile parts of the band

Base transmitters near the top of the band are near Base receivers in the bottom part



...so the FCC defined two sub-bands

And wrote rules to protect Sub-band A receivers from Sub-band B transmitters [§90.72



- **PTC-220's waiver request uses these same rules to protect operations throughout the 221-222 MHz band**

US-Canada *Interim Arrangement*

- The 1999 *Interim Arrangement* among the FCC, NTIA, and Industry Canada established rules based on FDD air interface operating on 5 kHz channels with only mobile units in the upper band segments
- The 1999 *Interim Arrangement* on 220 MHz governs until such time as the 1965 US-Canada Treaty governing these frequencies is amended.
- Section 1.2 of the 1999 *Interim Arrangement* provides that it “is subject to the PTC-220 arrangement and the request of either Administration.”
- The 2019 PTC-220 arrangement does not apply in the border area, nor will any future request of either Administration apply in the border without modification of the *Interim Arrangement*.

CONFIRMATION OF ACCEPTANCE		
<p>The attached document is the interim sharing arrangement between the Federal Communications Commission, the National Telecommunications and Information Administration (NTIA) and the Department of Industry (Industry Canada) concerning use of the 220 to 222 MHz frequency band. The Federal Communications Commission, NTIA and Industry Canada intend to implement the attached arrangement, to the extent permissible under their respective domestic laws, pending the amendment of the <i>Agreement Concerning the Coordination and Use of Radio Frequencies Above Thirty Megacycles per Second, with Annex</i>, as amended,¹ to incorporate the arrangement's terms.</p>		
<p>Donald Abelson Chief, International Bureau Federal Communications Commission</p>	<p>William T. Hatch Acting Associate Administrator Spectrum Management National Telecommunications and Information Administration</p>	<p>Michael Binder Assistant Deputy Minister Spectrum, Information Technologies & Telecommunications Industry Canada</p>
Date: 08 Dec 99	Date: 12/13/99	Date: 21/12/99
Date: 08 Dec 99	Date: 12/13/99	Date: 21/12/99

PTC Configuration vs. US-Canada *Interim Arrangement*

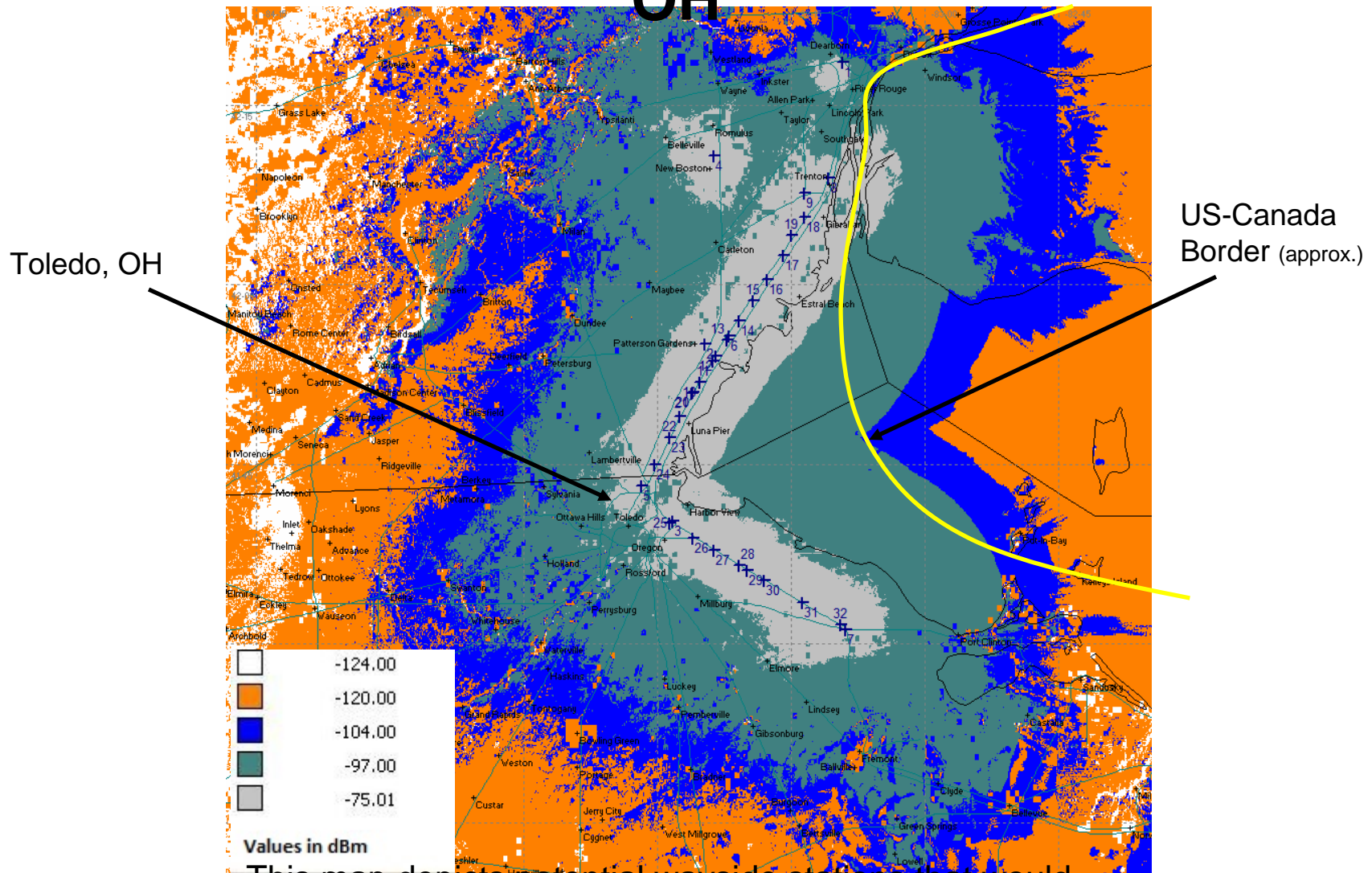
PTC-220 Rail Safety System

- TDD
 - Transmit and receive on the same frequency
 - Bases and mobiles transmit on any frequency within the 220-222 MHz band
- 25 kHz Channel Spacing
- Relaxed ERP and HAAT Limitations in Upper Band Segment
- Streamlined Coordination Obligation
- Common Frequency Operation Throughout Footprint

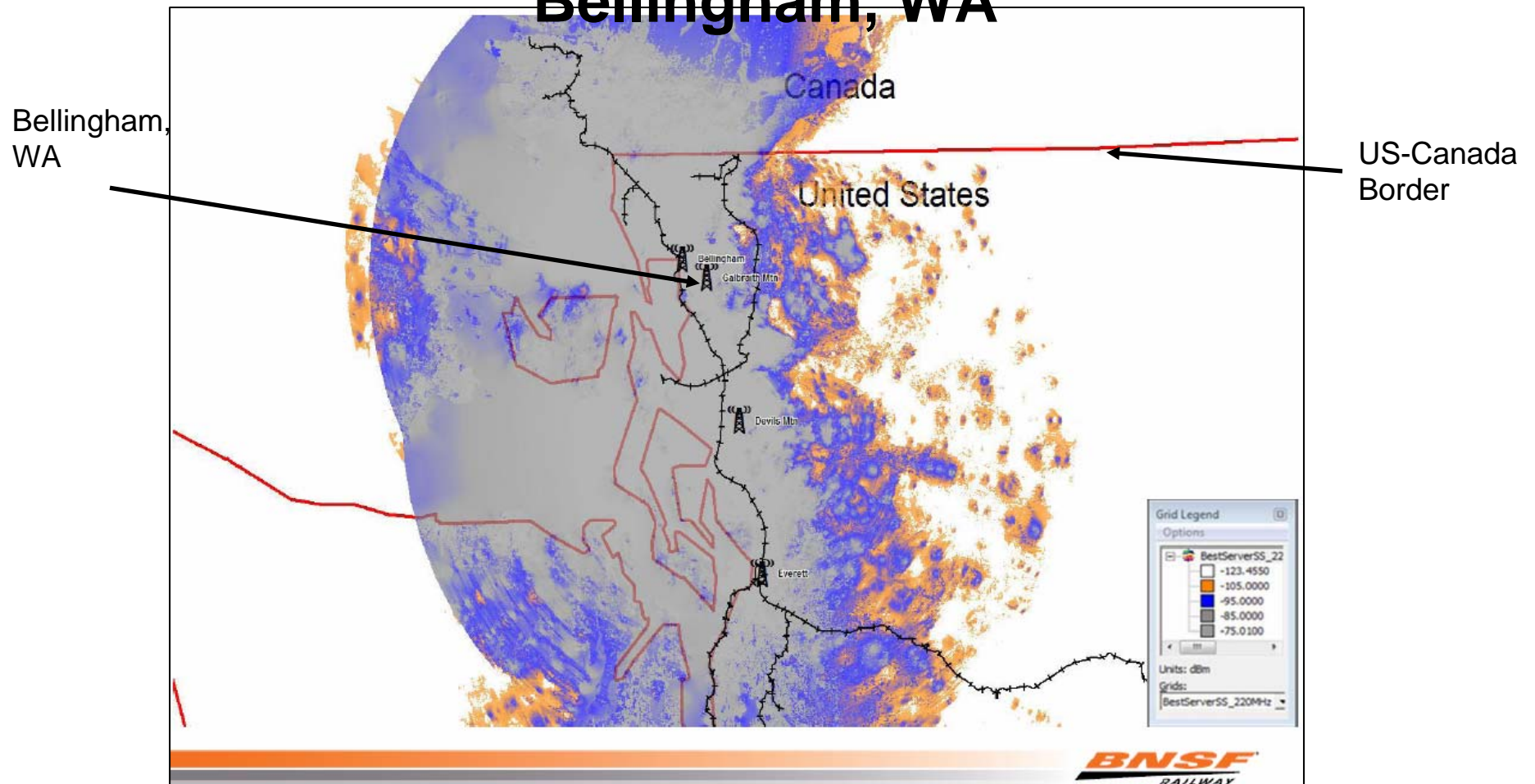
US-Canada *Interim Arrangement*

- FDD (IA, § 2.4)
 - Transmit on one frequency and receive on another
 - Bases transmit in 220-221 MHz while mobiles transmit in 221-222 MHz
- 5 kHz Channel Spacing (IA, Annex A)
- Stringent ERP and HAAT Limitations in the Upper Band (IA, Annex B(2))
- Stringent Power Flux Density Limitations at the Border (IA, § 4(a))
- Canadian Assignments of 220 MHz Channels on US-side of Border, Variable by Sector (IA, §§ 2.5.3 Annex A)

PTC Configuration at Canadian Border: Toledo, OH



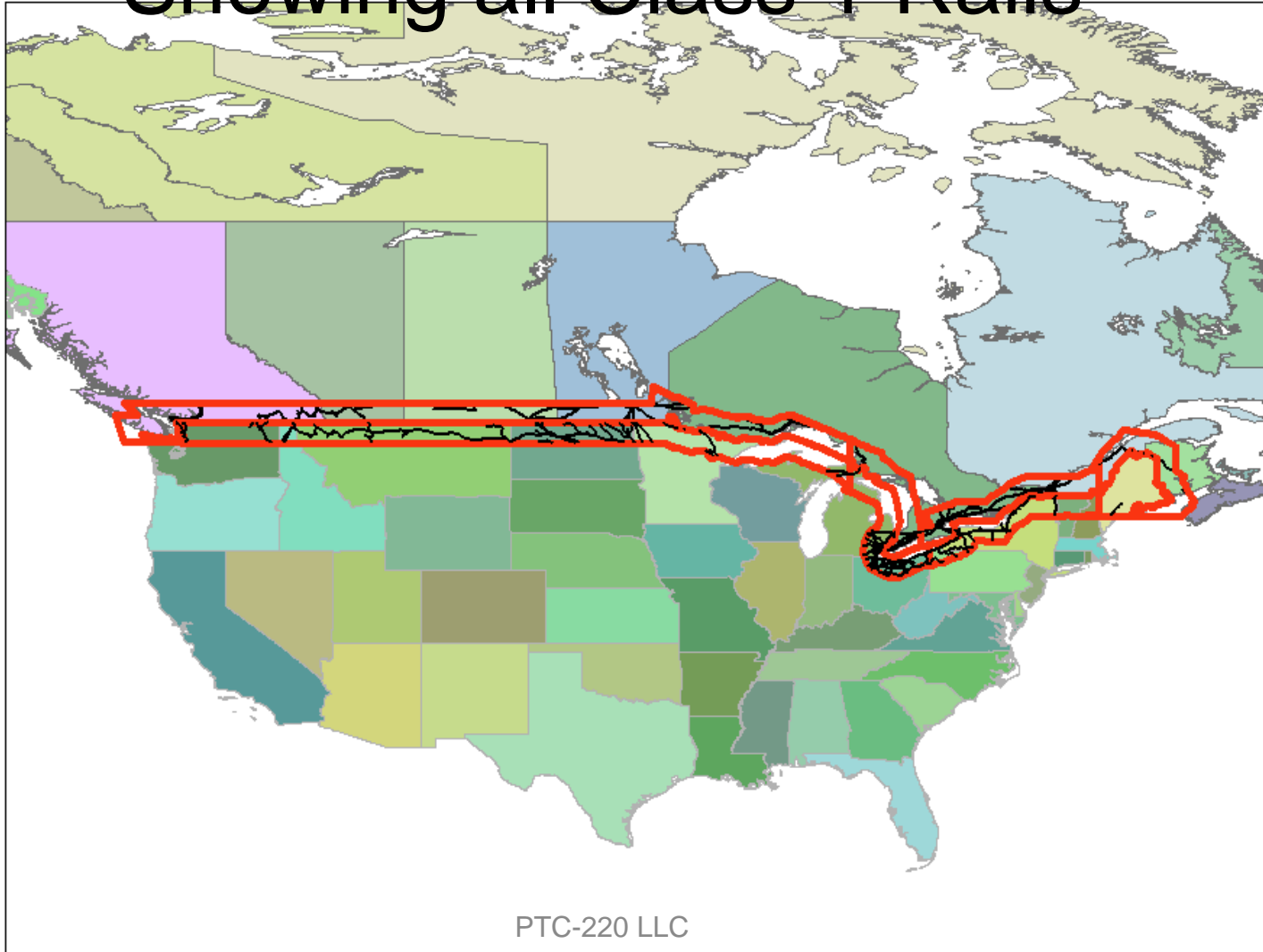
PTC Configuration at Canadian Border: Bellingham, WA



This map depicts potential wayside stations and base stations along rail lines near Bellingham, WA.

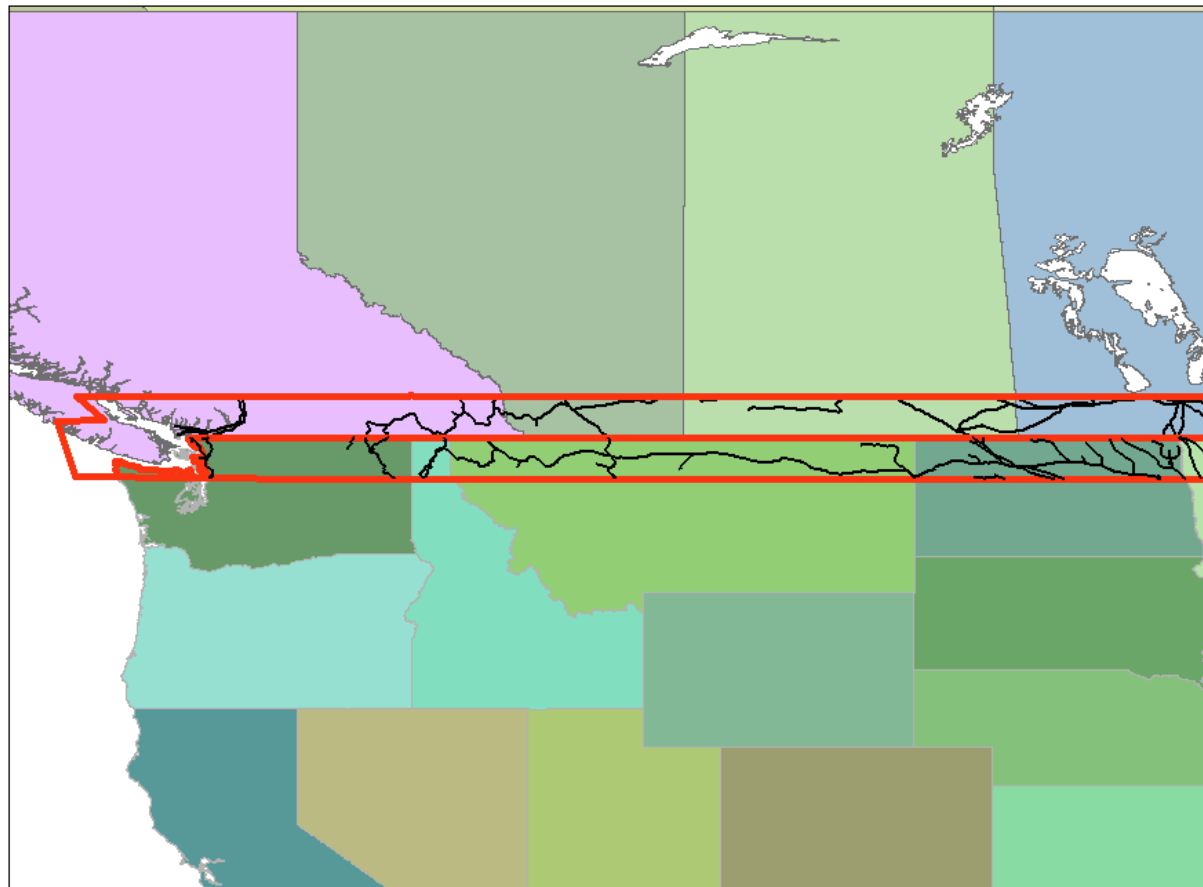
Overview of Border Coordination Zone

Showing all Class 1 Rails



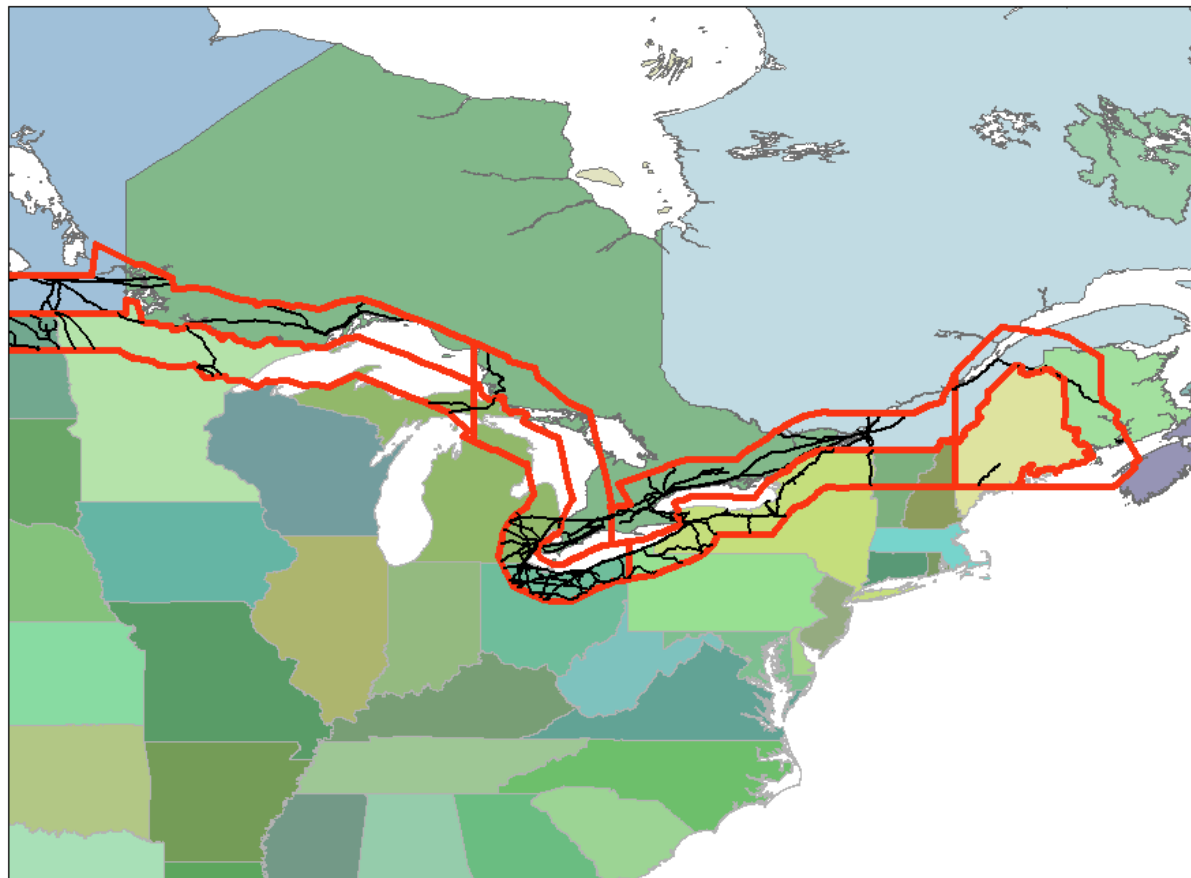
Border Coordination Zone – West Area

Showing all Class 1 Boils

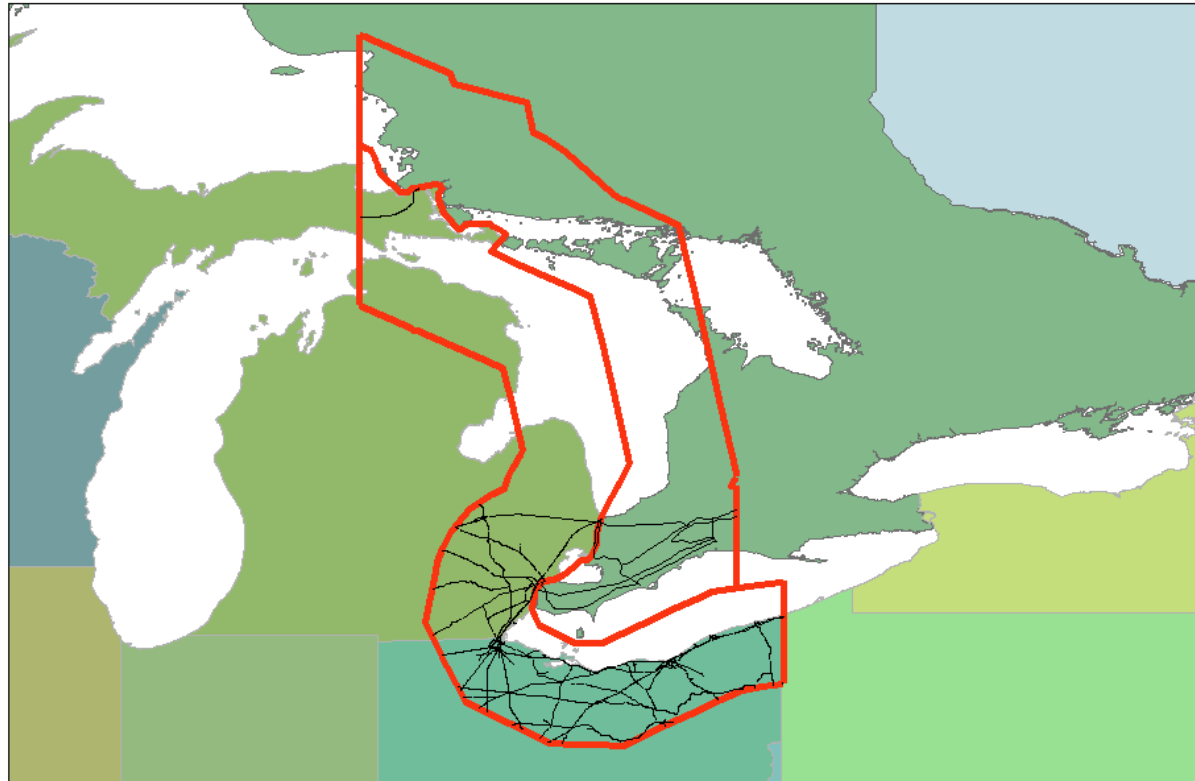


Border Coordination Zone – East Area

Showing all Class 1 Rails

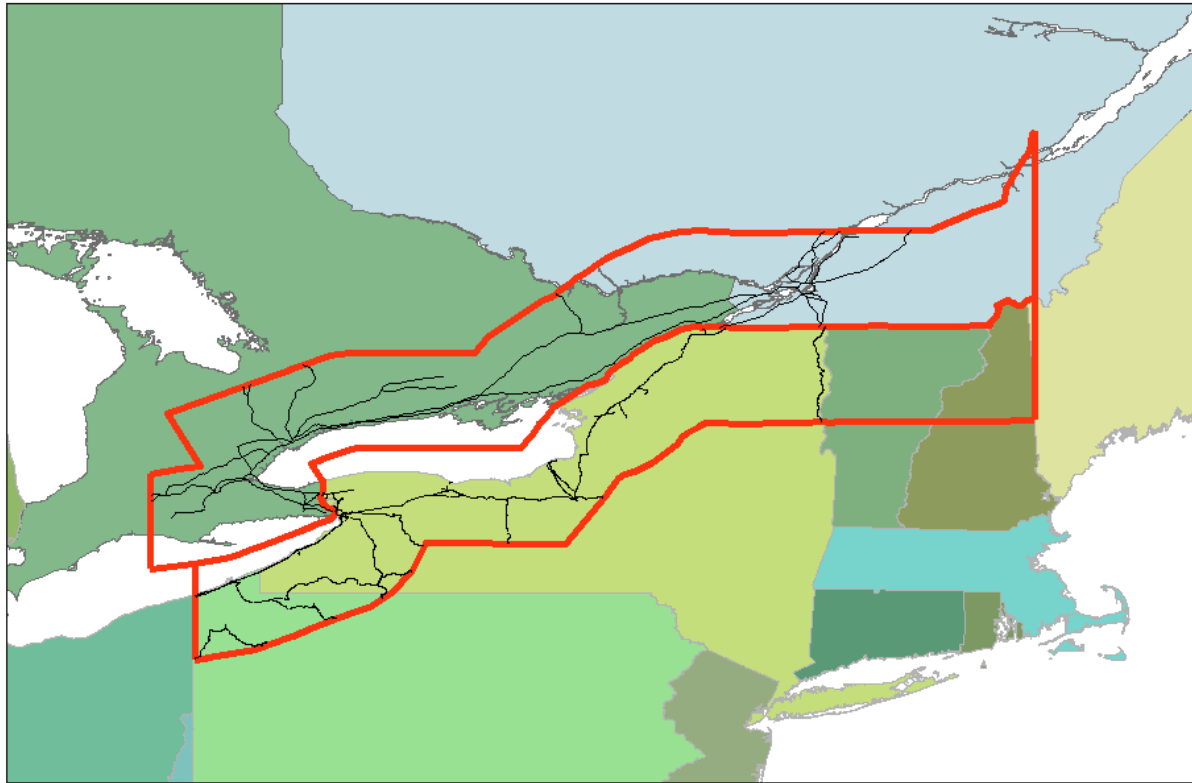


Border Coordination Zone Sector 1 – All Class 1 Rails



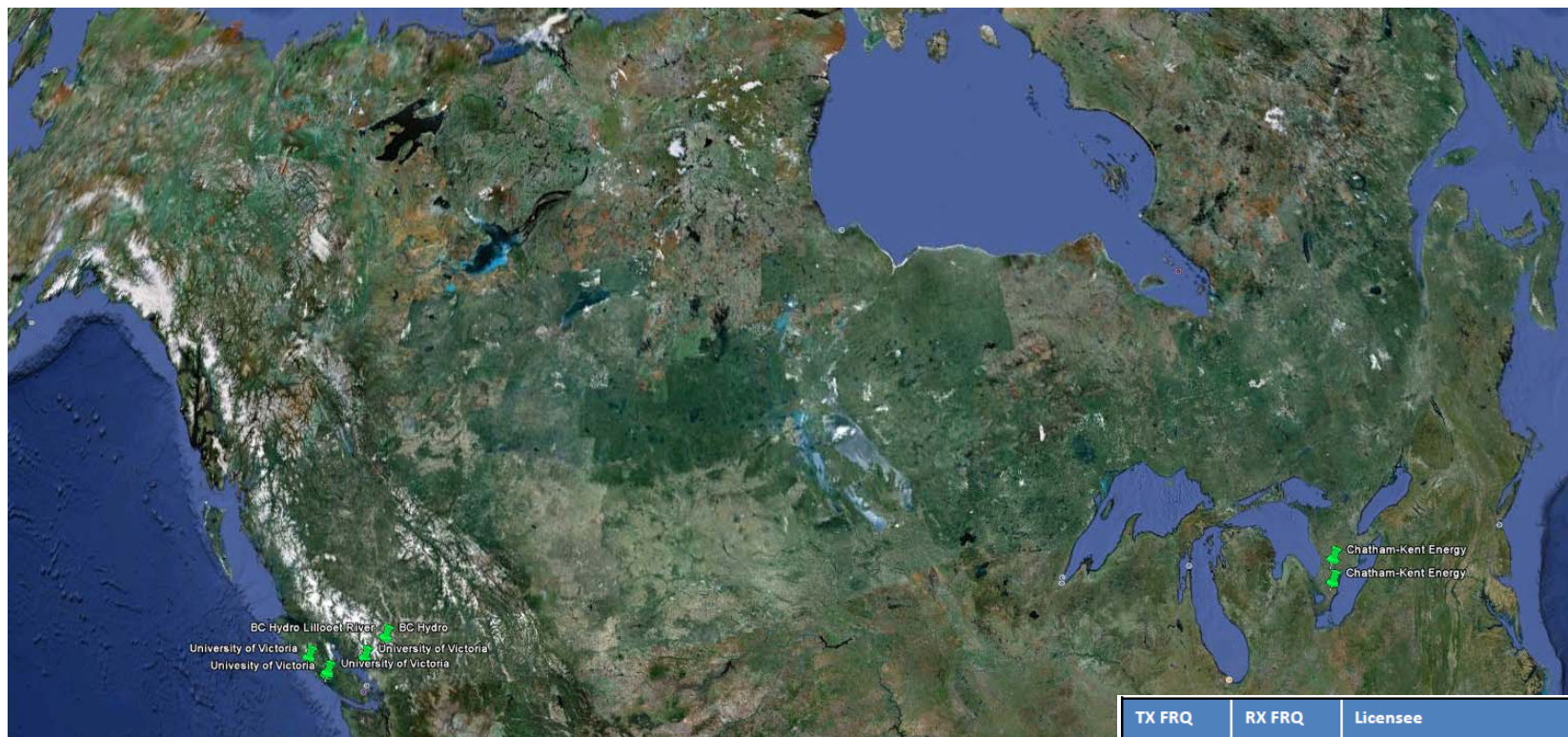
Sector 1 is defined as the area within 120 km of the border bounded on the west by 85 degrees West longitude and on the east in Canada by 81 degrees West longitude and in the United States by 80 degrees 30 minutes West longitude.

Border Coordination Zone Sector 2 – All Class 1 Rails



Sector 2 is defined as the area within 120 km of the border bounded on the west in Canada by 81 degrees West longitude and in the United States by 80 degrees 30 minutes West longitude and on the east by 71 degrees West longitude.

Very Limited Use of 220-222 MHz in Canada



Industry Canada has granted eight non-railroad licenses in the 220-222 MHz band to three licensees; these eight license locations are depicted here.

TX FRQ	RX FRQ	Licensee
220.4225	221.4225	B C Hydro
220.9625	221.9625	Chatham-Kent Energy Company
220.9725	221.9725	Chatham-Kent Energy Company
220.9775		University of Victoria
220.9775		University of Victoria
221.4225	220.4225	B C Hydro
	220.9775	University of Victoria
	220.9775	University of Victoria

RAC Meeting with Industry Canada

Railway Association of Canada (RAC) , the Canadian equivalent of AAR, met with Industry Canada (IC) on January 23, 2013 to discuss the possibility of adding PTC channels to spectrum licenses already managed by RAC.

- Industry Canada was briefed on PTC requirements in the U.S.
- Industry Canada indicated a willingness to assign the spectrum in Canada to the RAC
- Industry Canada agreed that 5 kHz channelization of the band should be reviewed as defined in 1999 *Interim Arrangement*
- Industry Canada indicated a willingness to review the 1999 *Interim Arrangement* with the FCC to accommodate PTC rail safety systems

Conclusion

- Design, testing, and implementation of PTC rail safety systems are currently underway to meet the Rail Safety Improvement Act's December 31, 2015 deployment deadline for Class 1 railways.
- PTC-220 member companies must begin design, testing and deployment of PTC operations in 2013 to satisfy the PTC mandate by 2015.
- Some of the nation's most rail-intensive areas occur along the US-Canada border.
- By not taking into account current generation PTC architecture, operation, and design, the 1999 US-Canada Interim Arrangement threatens to prevent the nation's Class 1 railways from meeting their PTC deployment obligations.
- Renegotiation of the 1999 *Interim Arrangement* is essential to permit timely deployment of PTC rail safety systems.

Backup

PTC Base Radio Specifics

Transmitter

- RF Power Output 75 W PEP, adjustable to 10 – 75 W
- Modulation Waveforms: 16 kbps pi/4DQPSK (linear); 32 kbps pi/4DQPSK (linear)
- Occupied Bandwidth: Meets 47CFR90.210 (f), five aggregated channels
- Modulation Designators: 16 kbps: 8K90DXW; 32 kbps: 17K8DXW
- Conducted Spurious Emissions: – 25 dBm max.
- Max. Duty Cycle Rating: 50 %



PTC Locomotive Radio Specifics

Transmitter

- RF Power Output 50 W PEP, adjustable to 15 – 50 W
- Modulation Waveforms: 16 kbps pi/4DQPSK (linear); 32 kbps pi/4DQPSK (linear)
- Occupied Bandwidth: Meets 47CFR90.210 (f), five aggregated channels
- Modulation Designators: 16 kbps: 8K90DXW; 32 kbps: 17K8DXW
- Conducted Spurious Emissions: – 25 dBm max.
- Max. Duty Cycle Rating: 30 %



PTC Wayside Radio Specifics

Transmitter

- RF power output: 25 W PEP;
adjustable to 7.5-25 W PEP
- Modulation waveforms: 16 kbps
pi/4DQPSK (linear);
- Occupied bandwidth: Meets
47CFR90.210 (f), five aggregated
channels
- Modulation designators: 16 kbps:
8K90DXW
- Conducted spurious emissions: –
25 dBm max.
- Max. duty cycle rating: 10 %



BNSF Sweet Grass Subdivision

Sweet Grass subdivision data:
Shelby, MT to Sweet Grass, MT
MP 101.4 to MP 138.9
LS 354

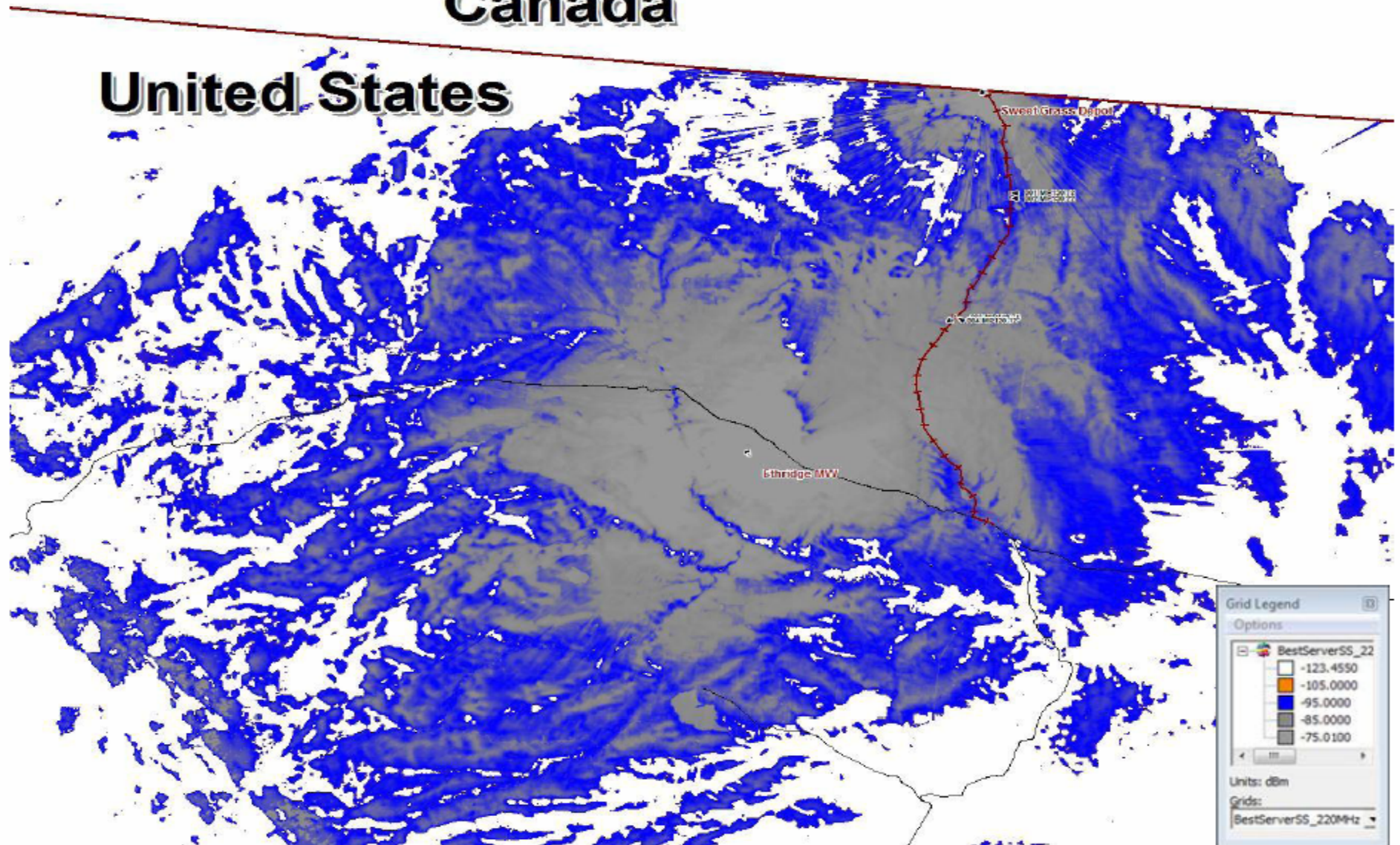
BNSF Sweet Grass Sub – Base sites

Name	NAD83		Antenna		
	Lat	Long	Model	Height (m)	Azimuth (degrees)
Ethridge	48.5755400	-112.2314300	SD214-SF3P4SNM	25.30	30
Sweet Grass Depot	48.9975000	-111.9577778	SD214-SF3P2SNM	12.00	250



Canada

United States



BNSF
RAILWAY